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curly dwarf and streak, necessitates the development of new varieties possessing greater disease-resistant qualities.

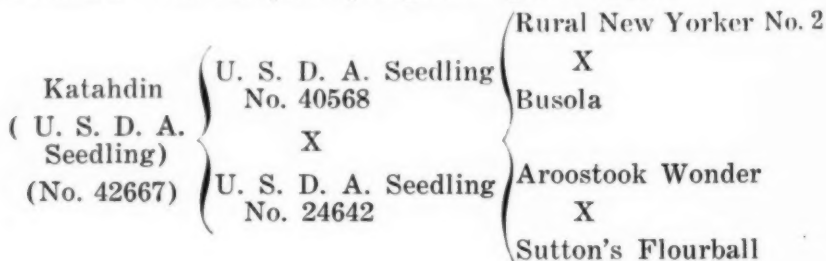
At the time our present commercial varieties were produced virus diseases did not occur, or at least were not recognized, hence there is little wonder that few of them possess well marked resistance to these diseases.

When potato breeding was actively undertaken by the United States Department of Agriculture in 1910 the only disease resistance sought was that against the late-blight fungus (*Phytophthora infestans*). It was not until some years later it became evident that the virus diseases were vastly more important in potato production than late blight, owing to the fact that potato viruses were transmitted from one crop to the other through tuber infection and in addition were not controlled by fungicidal applications to the foliage or by seed treatment.

Recognizing the importance of disease resistance or immunity in potato varieties it became necessary to search in the seedling progenies grown each year for plants that were apparently resistant to virus infection. Whenever possible these selections were crossed with other seedlings or commercial varieties possessing desirable tuber characters, good habit of vine growth or productiveness, for the purpose of recombining in some of the resultant progeny the more desirable attributes of the two parents. Progress along these lines has necessarily been slow. Many extremely promising seedlings were obtained but when subjected to the necessary probationary test period the majority of them became infected with one or more types of virus disease or proved to be unsatisfactory from the standpoint of yield, table quality, or other desirable characteristics.

### Origin

The Katahdin variety was first grown in 1923, at Aroostook Farm, Presque Isle, Me. It originated as the result of a cross between two unnamed seedling varieties, Nos. 24642 and 40568, each of which was obtained by crossing two commercial varieties. The complete pedigree is given below.



In selecting the parents for this cross the chief characteristics given special consideration were resistance to mild mosaic and good shape of tubers. Studies of the parent varieties had shown that both appeared to possess considerable resistance to mild mosaic. This resistance has evidently been transmitted to the progeny since the Katahdin, as well as other seedlings derived from the same cross, have so far given evidence of being very highly resistant to this disease.

The type of tuber characters desired was found in Seedling No. 40568, which was used as the female parent. The tubers of this variety were of good proportions, regular in outline, with smooth surface and shallow eyes. These characters are found to a high degree in the Katahdin.

Although both parents were comparatively low in yield so far as observations indicated, the combination resulted in an increased vigor as is evident from several high-yielding seedlings in this progeny.

### Description

Plants medium to large, spreading; stems thick, prominently angled; nodes slightly swollen, green; internodes slightly reddish purple or green; wings slightly waved or straight, green; stipules large, green, glabrous; leaves very long, broad, midrib green and scantily pubescent; primary leaflets close, medium green, 4 pairs, large, ovate, mean length  $77.23 \pm 0.55$  mm., mean width  $49.07 \pm 0.38$  mm., index  $63.54 \pm 0.27^2$ ; petioles green; secondary leaflets many, three positions, on midrib between pairs of primary leaflets, at junction of midrib and petioles of primary leaflets, on primary leaflet petioles; tertiary leaflets medium to many in number; inflorescence much branched, leafy bracts none; peduncles short to medium, pubescence scant; pedicles medium to long, green pubescence scant. Flowers—calyx lobe tips long, little pigmented to green, pubescence scant to abundant; corolla medium size, 30-32 mm. diameter, color a light lilac<sup>3</sup>; anthers orange yellow, pollen medium to abundant, good quality; style straight; stigma globose, multilobed, green. Tubers short, elliptical to roundish,

<sup>2</sup>Calculated by dividing the width by the length of each 100 leaflets and multiplying the average of these ratios by 100. The leaflets were taken from the fourth leaf from the top of the stem, one leaflet, the distal left lateral, being taken from each leaf. Since the potato leaflet is asymmetrical, the length was determined by taking the average of the measurements from the apex to the base of each respective lobe. This is a modification of the method described by R. N. Salaman in *Potato Varieties*, pp. 163-170. 1926.

<sup>3</sup>All color references are to Ridgeway, R.-Color Standards and Color Nomenclature 1912. This corresponds to Ridgeway's Mauvette.

medium thick, mean length  $82.05 \pm 0.20$  mm. (3.23 inches)<sup>4</sup>, mean width  $80.09 \pm 0.17$  mm. (3.16 inches)<sup>4</sup>, mean thickness  $60.53 \pm 0.20$  mm. (2.38 inches)<sup>4</sup>; indexes, width to length  $97.80 \pm 0.32^5$ , thickness to width,  $75.74 \pm 0.30^6$ , thickness to length,  $73.90 \pm 0.32^6$ , skin smooth, self-colored, dark cream buff<sup>7</sup>; eyes shallow, same color as skin; eyebrow medium long, curved, medium prominent; flesh white; sprouts, color dark, pale vinaceous-lilac<sup>8</sup>; maturity late.

### Characteristics

The Katahdin potato has been under observation and test for eight years at Presque Isle, Me., during which time it has been entirely free from mild mosaic; however, it is not resistant to spindle tuber or leaf roll. In comparative-yield tests at Presque Isle, in 1930, it was shown to yield about the same as Rural New Yorker and Green Mountain.

The results of cooking tests carried on in cooperation with the Bureau of Home Economics of the United States Department of Agriculture at different times have shown the quality of the stock grown at Presque Isle to range from fair to very good with moderately good as the average, these terms being used to designate the three highest classes for quality in a scale of five.

The tubers have excellent shape, short elliptical to roundish and few, very shallow eyes.

The Katahdin variety has wide adaption as shown by the tests that have been made as part of the cooperative potato breeding work organized recently between the United States Department of Agriculture and several of the state agricultural experiment stations. It was tested also on a small scale in 1930 by a number of private growers. A summary of these reports from widely separated sections of the country shows that this variety ranks high in the opinion of the growers. Emphasis is laid on its high yield, small percentage of culls, excellent shape, and shallowness of eyes.

<sup>4</sup>The average of measurements of 100 tubers, each of a weight of approximately 8 ounces (223-233 gms.).

<sup>5</sup>Calculated by dividing the width by the length of each of 100 tubers and multiplying the average of these ratios by 100. The data used for calculating the indexes were taken from the same measurements as those used to designate the dimensions of the tubers.

<sup>6</sup>Based on measurements of the same tubers as those used for determining the width to length index, using the same methods of calculation.

<sup>7</sup>Between Ridgeway's chamois and cream buff, classed as a white potato by the commercial trade.

<sup>8</sup>Corresponds to Ridgeway's pale vinaceous-lilac.

It is probably adapted to growing on muck and peat soils as shown by very favorable reports from Clear Lake, Iowa, and Elba, N. Y., in 1930. It is not well suited to regions where a summer drought is likely to occur, but wherever favorable soil moisture conditions prevail it is expected to give satisfactory yields. The vines of this variety do not mature early but observations in Iowa and Michigan the past season indicated that its tubers set early. At Clear Lake, in August, large tubers were found on this variety while on many of the others in the test the tubers were comparatively small.

The report from Michigan indicates the same characteristics, as the variety was outstanding in its general good type, the clean, bright color and the medium to large size of its tubers. The tubers of Russet Rural were very small in comparison.

Observations have shown that the tubers have very good keeping quality under storage conditions at Presque Isle, Me.

As part of the cooperative potato-breeding program rather extensive tests of this variety are planned for 1931. About 100 bushels of seed stock will be placed with several state agricultural experiment stations by the United States Department of Agriculture. The cooperators at these stations will carry on tests with approved growers on plots of one-twentieth to one-tenth of an acre in size. The yields of these plots will be compared with those of similar plots of standard varieties. These tests will give further knowledge of this variety from a commercial standpoint and of its range of adaptation. A considerable increase of seed stock will result also, so that a limited distribution can be made in 1932, if it seems advisable to the agricultural experiment stations in the respective states where the tests are made.

### Summary

The Katahdin potato is resistant to mild mosaic but not to spindle tuber or leaf roll. It is a high-yielding variety, producing tubers of excellent shape, with shallow eyes and desirable cooking quality. The vines mature late but the tubers apparently set rather early. Observations have indicated that it is probably well adapted to muck and peat soils. It is not believed to be well suited to regions that have summer droughts.

If favorable results are obtained in 1931 a more extensive introduction will be made in 1932, provided it seems advisable to the agricultural experiment stations in the states in which the tests have been made.



## Mechanical Injury to Potatoes and Its Eradication in North Dakota

R. C. HASTINGS, State College Station, Fargo, N. D

Close association with the inspection of fruits and vegetables, especially potatoes, during the past several years in Minnesota and North Dakota has greatly impressed the writer with the significance of mechanical injury and its effect upon the appearance, quality, condition and grade of white or Irish potatoes. Invariably this injury is a major factor affecting the quality of potato shipments. Very often it is practically the only factor with which shippers have to contend in sorting potatoes to meet a certain grade. Sometimes the injury is so prevalent and so severe that it is impossible for the shipper to attempt to sort the stock to meet any of the better grades. Furthermore, observations prove that this type of injury may be the fundamental cause for deterioration and a lower grade in transit or at destination. When one stops to think of the number of injured and deteriorated potatoes which were thrown out before he examines the actual shipments, he is appalled by the apparent waste and resultant costs of mechanical injury.

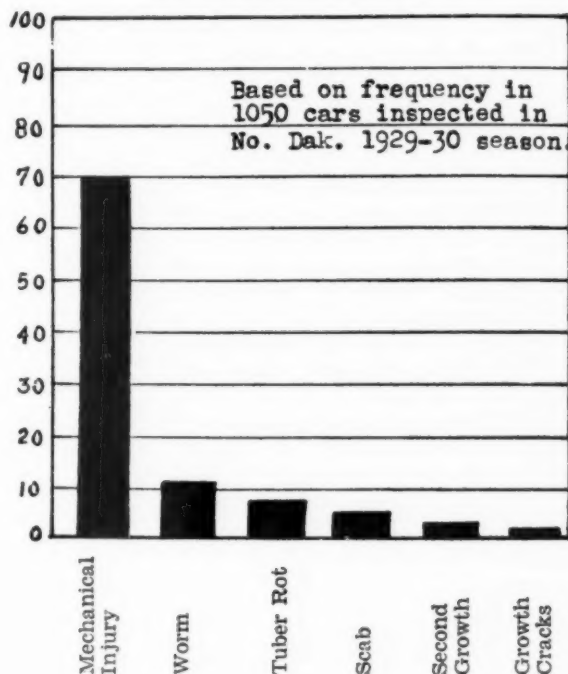
The importance of this factor in connection with North Dakota potatoes is doubled because the state suffers little from deteriorating tuber diseases to which stock from many other states are subject. A summarization was made of all the defects occurring in the first 1,050 cars inspected for grade in North Dakota during the 1929-30 season, to determine and show the importance of mechanical injury and to compare this blemish with other grade defects. Approximately 70% of all grade defects were attributable to mechanical injury. This data was included or published in Bulletin No. 13. The chart shows the result of this summary.

Practically all parties connected with potato growing and distribution realize that damage often occurs during the harvesting and marketing processes. Little attempt has been made to learn the exact source and extent of various injuries. By learning the exact sources a chance is afforded for further and more concentrated effort, which should result in practically eliminating all sources of serious or extensive injury. It was planned to learn this information in detail through a careful and accurate survey system, and to have the data collected by shipping point potato grade inspectors. It was planned to

make at least 300 of these surveys, but conditions were such that our inspectors could not find time to make the allotted number of surveys. It was possible to make fifty complete and detailed digging surveys and eighty-two picking surveys.

Injury was divided into two types, e. g.: serious and mild. Serious injury was considered such as would constitute a grade

**Relative Importance  
of Mechanical Injury and  
Other Grade Defects**



defect. Cuts were disregarded unless a cut potato also showed a bruise. Mild injury was considered as an injury which punctured or extended through the tissues or cells underlying the skin. This type of injury ranged from a relatively shallow puncture not over  $\frac{1}{8}$  of an inch in diameter, to relatively large, deep and serious types. Practically all survey projects were picked at random without previous reference as to conditions. Most of the diggers were equipped with an extension apron; a few were equipped with the agitating rack or vine director type of attachment. The report included variety,

maturity, size, type and yield of potatoes, make, age, and power of digger, type and condition of soil, and weather prevailing.

A study of the survey figures reveals much. There is no question but what a great deal of injury generally occurs before the potatoes leave the field. By picking potatoes directly behind diggers into a carefully padded basket, it was found that the digging process alone was injuring an average of 38% (by weight) of the potatoes. Digger injury ranged from none to 88%.

Ordinary picking into wire baskets resulted in an average of 16.6% injury, usually of a mild type. Picking injury ranged from 9% to 44%. Some types of baskets caused rather severe damage, other types a large amount of very mild injury.

None of the makes of diggers behind which tests were completed were immune from causing injury. There was, however, a spread of 11.5% between the average amount of injury found behind the various makes of diggers surveyed.

The average injury occurring with a damp soil was 21.5% as compared with 39% when dry.

The six tests behind tractor-drawn diggers, including four with a power takeoff, averaged 56.5% injury as compared with 35.5% average by the horse-drawn diggers.

Digging injury showed some variations as to variety. Since the various makes of diggers were pretty well distributed in each variety, the averages would fairly represent the susceptibility of the varieties to injury:

Cobblers averaged 43.4% injury.

Early Ohios averaged 39.1% injury.

\*Triumphs averaged 44.9% injury.

### Digging Remedies

It was possible, while making these surveys, to substantially reduce the digging injury being normally incurred. The average reduction amounted to 28.9%. There were 13 instances where the party collecting data or perhaps the farmer digging, did not have time or facilities at hand to make digger changes. When the changes were possible, however, injury was reduced from a total average of 38% to 12.1%. It might be mentioned

\*In the Triumph surveys three of the diggers already had had rear aprons removed. If we average the injury occurring in the Triumphs dug without digger changes as they were dug in the surveys with the other varieties, we find an average of 59% digging injury.



here that it would no doubt have been possible, with perhaps an occasional exception, for this injury to have been reduced to 5% or less of a very mild type, had the proper tools, time and equipment been at hand.

There were a few remedies which were commonly used, and which will be briefly discussed. It so happens that most diggers are built with a steel rod apron which elevates the potatoes from the shovel and a similar rear apron upon which the potatoes and sometimes dirt falls before they drop to the ground. In almost all cases much injury was occurring in this drop to the second apron. This drop varies with different diggers but ranges from six to ten inches. This drop appears to be too great for potatoes, especially if they strike these bare rods and are slightly on the green or tender side. In fact, it was very easy to duplicate and demonstrate the injury by simply holding a freshly dug potato four to six inches above these rods, and letting it drop. One common method of avoiding this injury was simply to remove the rear apron. However, if considerable earth was coming over the elevator this sometimes resulted in some potatoes being covered. Occasionally lots of rather hard clods were riding over the elevator, and the added drop to the ground resulted in considerable clod injury. Little or no other disadvantages were prevalent with this remedy.

Where excessive dirt covered potatoes or where clods caused excessive injury when the rear apron was removed, it was often possible to remedy the situation by making one continuous chain out of the two aprons. This arrangement in a great many instances proves ideal, and affords a chance to get rid of most of the earth and still avoids the drop to a rear apron. If clods are present it reduces the drop to the ground. This arrangement does have some disadvantages in that it appears to pull slightly heavier and that it cannot be applied in all cases. Sometimes the apron rods or drive wheel sprockets may be worn so much that it permits the apron to slip or ride over the sprockets. Occasionally the rear apron is narrower or lighter than the front apron. It appears as though most diggers were not built or set up for this arrangement. There is no question however, but that most diggers could easily be set up or arranged for this method. Occasionally diggers were driven so fast that potatoes would be tossed or thrown as they reached the high point of the continuous apron, and injury resulted. With some diggers this re-arrangement must also be accompanied with driving which is not too fast. When damp rainy weather occurred the continuous apron arrangement was discontinued by most growers.

When neither of the above re-arrangements were applicable, another system was applied. A strip of old 6-inch belting was bolted on the frame so as to extend well over the hooks of the rear apron. Sometimes this in itself gave a substantial reduction in injury. If little or no earth was dropping onto the rear apron and potatoes dropped onto the bare rods, injury still occurred. In these cases it was common to simply put a canvas or burlap belt (made of two sacks) completely around the rear apron. This made a cushion upon which potatoes could fall without injury.

Two or three of the diggers were equipped with a rod shaker type of a rear attachment. This type of rear apron attachment appears to give considerable injury and often of a severe type. When little or no earth was coming over the elevator apron, this attachment was removed to advantage. If this attachment was needed to continue the separation of earth, the rods (which extend back lengthwise of the digger) were covered with rubber hose or even inner tubes cut to proper lengths. Other portions of the attachment should also be cushioned.

It happens occasionally that considerable injury occurs on the elevator (or front apron). This is demonstrated by the fact that upon removal of the rear attachment occasionally injury is still prevalent. This was the case in the three cases of Triumph digging in the above surveys. Rear aprons were removed, but still there was an average of 31% injury. This was accounted for by too little dirt coming up the elevator, sometimes due to digging too shallow, and to unnecessary agitation caused by kickers or elongated sprockets or pulleys. In these cases injury was materially reduced or practically eliminated by digging as deep as necessary and replacing part or all of the agitators with ordinary smooth, round pulleys.

As mentioned above, it was not always possible for the inspectors to make all the changes which were apparently essential for the greatest reduction of injury, in each case. To do this he should be equipped with tools, extras and other essentials.

It so happens that when fairly heavy soil becomes damp or wet and sticky, it covers many portions of the digger, such as the rear apron rods, with a coating of mud or earth which in turn acts somewhat as a cushion and prevents a great deal of injury.

On one or two surveys where injury was not reduced as much as it apparently should have been, it was discovered that the source of injury was at the lower pulley on the elevator apron.

With this apron attached three or four inches above the rear end of the shovel and traveling fast as it turned the front pulley, the apron rods would strike and injure large potatoes riding up near the shovel.

From the above discussion, it will be observed that diggers could be so built that very little injury need occur. Farmers could re-arrange diggers already in use with very little time or cost, so as to prevent most of the injury now prevalent. Re-arrangements must apply, however, to the prevailing conditions. The construction and sale of a properly protected rear attachment or rear apron would be a material benefit. A cushioned apron rod associated with proper protection from the hooks appears to be an ideal arrangement and applicable for varying conditions.

### Picking Remedies

As formerly indicated, when potatoes are picked in wire baskets, picking injury is always to be expected, its amounts depending largely upon the degree of maturity, the care practiced by the pickers and the type of basket in use. It was found, however, that practically all basket injury could be eliminated. Since the bottom of the basket is invariably a source of injury, it should have some sort of protection. It was found that a simple pad made of canvas or coarse linoleum, cardboard or corrugated paper cut to fit and tied to the bottom was all that was needed. Immediately many might say this will not let the dirt out. In reality, however, very little if any trouble was experienced with extra dirt. In fact, the writer feels that oftentimes less dirt accumulates and gets in the sacks with a pad than without one. Ordinarily, setting partly filled baskets down on edge tends to pick up dirt whereas the pad prevents much of this.

If side injury is experienced, a canvas attached to the inside of the basket to about two inches from the bottom gives ample protection and lets dirt escape. With many of the upright baskets, old grain sacks are just the right circumference.

During this survey work, baskets were carried along to demonstrate how injury occurred and how baskets could be remedied. Injury was so evident and the remedy so simple that few of the growers hesitated in correcting their baskets. The writer feels that a simple and harmless basket could be made and sold at a very little extra cost.

Incident with this work, observation was made of field cracks that often occur on Triumphs and sometimes on Early Ohios.

It was noticed that, although growing conditions just previous to digging as well as soil and weather conditions at digging time appear to be factors, bruising, although ever so slight or mild, also appears to be an important factor in this connection.

### Conclusions

Although injury to potatoes is a very important factor, affecting quality every year, it is possible that if surveys similar to the above had been made during the past several years the average of the digging and picking injury would not have been quite as great as is indicated above. Variation in the amount and the severity of injury would be expected, because of seasonal differences in maturity and weather. It so happened that stock did not mature until exceptionally late this season. The development of decay in these injuries would also vary very much, depending upon weather, temperature and general storage conditions. Damp, rainy and rather warm weather prevailed for about ten days this fall. During this period potatoes which were not in ideal storage showed a progressive type of rot in the injuries.

From this survey and past observations, it would be safe to arrive at the following conclusions:

1. That an appalling amount of injury to potatoes occurs before they leave the fields.
2. That all makes of diggers followed in this survey and when used as they were sold, without proper re-arrangements, caused an excessive amount of injury.
3. That wire baskets are invariably a source of injury.
4. That practically all of these injuries can be avoided with a few minutes time and little extra costs.
5. That the re-arrangements of diggers must be in accordance with or be properly applied to conditions.
6. That it would be possible and practical to build future diggers, and rear attachments, which would cause little or no injury and would be adaptable to all conditions, and at practically no extra cost. That this also applies to picking baskets.
7. That where these injuries alone are avoided, an enormous amount of grade throw-outs, deteriorating rots and shrinkage in weight would be eliminated. Stock would have a better appearance, and would sell better with less labor and trouble involved.

## Effects of Fertilization on Yields and Quality of Potatoes

B. A. BROWN, Agricultural Experiment Station, Storrs, Conn.

In Connecticut, it is customary to fertilize the potato crop heavily. In some cases, growers have attempted to overcome with commercial fertilizers other factors which limit their yields. In fact, quite frequently 2500 to 3500 pounds per acre of 5-8-7 or similar grades have been applied. Such practices have raised again the question of the rates most likely to give optimum quantity and quality of potatoes under our conditions.

About fifteen years ago, the Storrs Station conducted experiments during each of four years to measure the yields from various amounts of fertilizers. The conclusion reached was that a ton per acre of fertilizer containing 4 per cent nitrogen, 6 per cent phosphoric acid, and 4 per cent potash was sufficient. However, the trials were on a rather heavy upland soil and some doubt has existed as to whether the results would apply on the lighter soils where most of the potatoes in Connecticut are grown. Therefore, for the past three years, fertilizer rate tests have been conducted on a farm with sandy loam soil, not recently manured. The 1930 tests were on the same plots as in 1929, thereby giving some idea as to any accumulative deficiencies. The following list gives the essential facts in regard to fertilizers used:

Year	Fertilizer Grade	Pounds per Acre
1928	5- 8- 7	500 to 4000 in 500 pound increments
1929	10-16-14	500 to 2000 in 250 pound increments
1930	10-20-10	500 to 2000 in 250 pound increments

Plots were 100x15 feet and replicated twice. All of the fertilizer was placed in the furrow by hand and planting was done in the ordinary way with a "two man" machine. The three largest rates were repeated, broadcasting one-half of the fertilizer. Good cultivation and spraying were practiced.

The results have been interesting to those who have come in contact with them. Briefly they may be stated as follows:

(1) In all of the three years, 1000 pounds of 5-8-7 or its equivalent has not produced maximum yields.

(2) In 1928 and 1929, the largest yields per acre were obtained from 1500 pounds of 5-8-7 or its equivalent, while in 1930, the highest returns were from 2000 pounds.



(3) Applying more than 2000 pounds of 5-8-7 or its equivalent in the row reduced the stand appreciably and also retarded the early growth of the potatoes.

(4) No advantages were derived from broadcasting one-half of the fertilizer.

(5) Cooking tests to date have indicated no appreciable differences in the quality of the potatoes from the variously fertilized plots.

Thus, these recent results obtained on a different soil type and with other conditions different, substantiate the earlier conclusions, viz., that one ton per acre of ordinary fertilizer, such as 5-10-5 or 5-8-7 is ample for maximum potato yields when ordinary methods of culture are used.

The relative importance of the three plant nutrients is also of interest. On a loam soil, which had been neglected for several years, the omission of either phosphoric acid or potash has been about equally detrimental, the average reduction from the maximum yield being approximately 30 per cent in each case. Nitrogen is not so important on this soil and small decreases have resulted from its omission.

In these experiments, each nutrient is applied at four rates, holding the other two constant at optimum amounts. The maximum yields have been secured from fertilization very similar to that giving the best results in the trials mentioned previously. In other words, the use of more than 100 pounds per acre of nitrogen, 160 of phosphoric acid and 120 of potash has not been justified.

Although we have not grown potatoes continuously on the same land long enough to draw conclusions, it seems probable the amount of phosphoric acid and possibly the potash may be reduced under such conditions.

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## The Motor Truck and the Potato Market

C. W. WAID, Department of Agriculture, Columbus, O.

The increase in the use of the motor truck in the hauling of potatoes to market has been so rapid during the last decade that it is difficult to realize how much of a change has taken place.

The writer recalls that at a meeting held about ten years ago and which was attended by representatives of potato growers and dealers from nearly all potato growing states east of the

Mississippi that the problem of the use of the motor truck in connection with the marketing of potatoes was raised but that only two representatives present at the meeting considered the problem of sufficient importance to discuss it.

At the present time the motor truck is receiving much attention as it is recognized as one of the chief means of hauling potatoes to market in many states. In Ohio for example out of a normal potato production of ten to twelve million bushels annually not more than three or four hundred carloads are shipped. The balance of the crop reaches the market via motor trucks chiefly. The same situation exists in many other potato producing sections of the country. In fact there are very few states which are not feeling the effects of this method of transportation. The railroads are feeling the effects of this form of competition and in some states have tried to secure legislation which will tax motor vehicles more heavily owing to the free use of the highways by them.

Legislation is also being sought by several states looking to the licensing of motor trucks which handle potatoes or other farm products. The purpose of such legislation is to secure a greater degree of control over a certain class of operators of trucks in the handling of perishable food products.

From the potato producers' standpoint there are advantages in the use of the motor truck in the handling of this crop. The grower who owns his truck and uses it to haul his potatoes to market is able to extend his marketing possibilities to towns and cities many miles more distant than when he was dependent upon horses and wagons for this purpose.

Another advantage is that many growers find it very convenient to sell their potatoes to truck operators. These operators often drive direct to the field when the potatoes are being dug and take them direct from the field to the market. That this appeals to many growers is evident from the fact that it is getting to be quite a common practice in some sections and is being extended to others every year. It enables the grower to dispose of his crop with the least possible handling and relieves him of all expense of storing or pitting. Then there is the advantage of quick returns which to many is one of the chief benefits of this plan of marketing.

However, in spite of the advantages of the use of the motor truck in the marketing of potatoes there are also disadvantages which are serious. For one thing the competition between motor truck operators in many sections has become so keen that some of them resort to unwise if not questionable methods. One of the tendencies is to buy the potatoes field run and then claim that they are graded when sold. This practice results

in the dumping onto many markets of poorly graded potatoes which of necessity has a depressing effect upon prices.

Potato growers who live near good markets sometimes wonder why their potatoes do not sell well in competition with those from more distant producing points. This is easily explained as the practice to which reference was previously made of allowing field run or poorly graded potatoes to reach the markets either directly or through truck operators gives potatoes from such sources a poor reputation on these markets and dealers who prefer well graded potatoes soon learn to buy from others.

There is another practice which is very harmful so far as the influence on potato prices is concerned and that is the lack of any system among motor truck operators as to the distribution of the potatoes. The potato grower who uses his own truck with which to market his potatoes usually sticks to one or more nearby markets. He expects to stay in the potato marketing business for many years and thus is desirous of building a reputation for dependability and quality of products in his dealings. On the other hand the motor truck operator who may be in the business only for a season or at least for a short time is looking for sales which will net him the largest immediate returns. He is inclined, therefore, to change from one market to another whenever prices seem to justify. This tendency often results in one market being oversupplied while perhaps some other nearby market may not have enough potatoes for immediate needs. Then the next day or week the reverse may be true.

The variable supply is not the worst feature of this hit or miss, mostly miss, way of marketing as variable prices are even more evident than the variable supply would seem to justify. The truck operator who has only one load of potatoes as his immediate investment is interested primarily in a quick return. He does not hesitate, therefore, to cut prices in order that a sale may be made. It is a common practice for some dealers to play one sale against another thus a price cut even on a truck load of potatoes may have more influence on the market than seems justified. Unfortunately such cuts in prices are not as a rule reflected on to the consumer.

Another unfavorable development of the use of the motor truck on long hauls is the antagonism engendered in the minds of local growers against those who come in from a distance. Whether justified or not most growers seem to think the local market belongs to them or at least they should be given preference on such a market. Therefore, when a truck load of competing produce comes to the local market from a distant point the local producers are inclined to resent such intrusion. This

is especially the case when they learn that the truck operator is not a producer.

Other arguments both for and against the use of the motor truck in the marketing of potatoes could be advanced. Enough has been said, we believe, to show that the problems which have arisen because of the rapid increase in and extended use of the motor truck for this purpose are serious and that they are not easily solved. In fact it is our contention that the use of the motor truck has greatly complicated our marketing problems and that we need very careful study of the entire problem in order that the best features may be encouraged and the bad practices and tendencies discouraged and controled.

It is not only a state problem but interstate as well, as many of the undesirable features of this development have arisen because of the hauling of truck loads of potatoes and other products from one state to another. The laws of one state may permit the sale of potatoes of low grade or no grade, while an adjacent state may prohibit the sale of all potatoes except specified U. S. grades or grades of their own specifications. It will readily be seen that such variations in state laws invites complications when it comes to the hauling of truck loads of potatoes from one state to another.

We cannot bring this article to a close without calling attention to the fact that the motor truck has greatly complicated the crop estimate and crop movement situation. Those in charge of this service either at Washington or in the respective states are without doubt desirous of giving out only dependable information. However, they find it very difficult to secure complete information about the total volume being moved to market via motor trucks at any given time. Thus everyone who can help in the working out of this complicated situation in a satisfactory manner should feel it his duty to do so.

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## The Colorado "600-Bushel" Club

C. H. METZGER, Colorado Experiment Station, Fort Collins.

The 1930 season, in one respect, was the most successful in the four years of the Colorado "600-bushel" potato club. Nineteen growers obtained memberships. These growers were located in four different counties, Montrose, 10; Rio Grande, 4; Garfield, 3, and Costilla, 2. Although the number of growers is the largest in the history of the club, 11 in 1929, 4 in 1928, and 11 in 1927, the average yield for the 1930 members is the

lowest so far, as there were no outstanding yields. The average yield for 1930 was 653 bushels; for 1929, 752.56 bushels; for 1928, 767.25 bushels, and for 1927, 710.2 bushels. The yields in 1930 range from 602 to only 757.29 bushels, which is considerably below the 1,145.17 bushels which was high for the previous season. Six of these growers have been members of the club before and 13 are new.

C. P. McKelvie, of Monte Vista, is "Potato King" for Colorado in 1930, with his 757.29 bushels of Peachblows. His farm joins that on which L. G. Schutte raised 1,145.17 bushels in 1929. McKelvie's crop was grown on alfalfa sod to which manure had been applied at the rate of four tons per acre. This land was spring plowed; 1500 pounds of whole seed per acre; rows 32 inches apart, and hills 17 inches apart, cultivated and sub-irrigated.

The Rural group led all varieties in producing six of these yields. The Peoples Russet was second with five yields over 600 bushels. Four of these yields were made with the Peachblow, including the highest yield for the year. The Brown Beauty fell below its usual performance and is only represented twice. To show that last year's 600-bushel yield of Bliss Triumphs was no accident, this variety is represented twice, once in Montrose county and once in Rio Grande county.

One of the outstanding features of this year's membership is the high percentage of improved seed used. Thirteen of these yields were produced with seed of certified origin, and two with seed from the growers' own seed plot. In 1927, only one grower used certified seed and only two had seed plot stock. In 1929, ten out of 11 growers used seed of certified origin. These last two years are convincing proof of the producing ability of certified seed.

Not only must the seed be good but the seed pieces must be large and plenty of seed used per acre. These growers used an average of 1405 pounds per acre, while the average grower uses 1000 pounds. Four used whole seed.

One of the most important things the 600-bushel club has demonstrated is the value of alfalfa sod for potatoes. Fourteen of these yields were produced on alfalfa sod, six of which had the second cutting plowed under the previous fall. One was produced on sweet clover land, on which the sweet clover was used as a green manure crop. Three were produced on land which had been in peas, and one on land three years in sugar beets preceded by alfalfa. Eight growers used an average of eight tons of barnyard manure per acre; seven plowed under green manure; one plowed under pea vines, and one used treble super-phosphate at the rate of 100 pounds. These practices demonstrate clearly that potatoes do best on land that contains plenty



of humus, which improves the physical composition of the soil and makes plant food available.

Ten of these growers spring plowed; four fall plowed and re-plowed in the spring, while five fall plowed only. The average planting distances were 34.2 inches between rows, and 11.5 inches between hills. The average number of cultivations was 3.63. Four growers sub-irrigated and the other fifteen irrigated an average of seven times each.

Proper attention to seed, rotation, preparation and care have made these yields possible. Many more growers can become members of the "600-bushel club" by giving proper attention to these four things.

## The Value of Small Potatoes for Seed Purposes

H. S MacLEOD, Saanichton, British Columbia, Canada.

**Experiment, Whole vs. Cut Seed :** The object of this experiment is to compare the yields from crops planted with whole seed to those planted with cut seed, using high quality seed of the same variety and under the same condition, and to determine the difference, if any, in yield.

Potato growers on soils that were cold and rather wet at time of planting found that a large percentage of the cut seed rotted in the ground, causing many misses and reduction in yields. Hence the reason for this experiment.

This is the third year that we have conducted this experiment. The results each year show that whole seed gives higher yields than cut seed under the conditions mentioned above. The results this past season were as follows; in tons per acre:

	Marketable	Unmark'ble	Total
Whole Seed .....	6.38	2.24	8.62
Cut Seed .....	5.02	2.05	7.07

The difference in yields shown this year is not as great as in 1928 at Sumas, B. C., or as in 1929 in Lulu Island, B. C. This is owing to the fact that in both of those years the soil was more wet and cold at times of planting, and consequently the cut seed then rotted in the ground to a greater extent. This past season the amount of moisture in the soil, even in the early part of the season, was much below the average.

The potato growers of this province appreciate the action of the department in having put into effect a new grade known as "Certified Seed, Small Size," to include potatoes from 1½ to 3 ounces. This will be of much value to the potato growing industry here.

## Crop and Market News

(Contribution from the Bureau of Agricultural Economics)

### Prices Tending Downward

The March advance of potato prices apparently could not be sustained. The higher price-levels attracted very heavy shipments, sometimes averaging 900 cars per day, and values declined almost as fast as they had advanced. Furthermore, the active opening of the season for new southern potatoes doubtless weakened the market for old stock to some extent. By mid-April, movement of northern and western potatoes had decreased to a daily average of about 700 cars and new stock was averaging about 75 cars per day, but was still much lighter than a year ago. Florida and southern Texas were the principal sources of new potatoes, while Maine and Idaho continued to ship most of the old stock from storage.

Cars containing a fairly large proportions of 1½-inch minimum Bliss Triumphs were returning \$2.75-\$2.85 sacked per 100 pounds at shipping points in the Rio Grande valley or Texas, while straight U. S. No. 1 cars sold at \$3.25-\$3.50 per cwt. City dealers were getting mostly \$3.75-\$4.25 for these larger sacks and \$2-\$2.40 on the 50-pound size. In the Hastings district of Florida, best Spaulding Rose potatoes were returning \$5.50 per barrel in mid-April, after having opened at a considerably higher level. Terminal markets quoted these potatoes mostly within a jobbing range of \$7.50-\$8 per barrel, which was higher than a year ago because of the delay in the 1931 season.

Among the numerous shipping areas for old potatoes, about the only ones to show a sustained advance of price over the mid-March level were western New York and the Yakima Valley of Washington. The mid-April f. o. b. price at western New York points was \$1.60, which was lower than the price during the first part of the month but still above the March figure. After having advanced to a relatively high point, sacked Green Mountains in northern Maine dropped sharply to \$1.35 per 100 pounds, and Russet Burbanks declined to 75c-80c in the southern part of Idaho. Shippers in the north central area were getting only \$1.25-\$1.40 in mid-April, while the price range at Colorado loading stations had declined to \$1-\$1.25. Values of best Russet Burbanks were fairly well sustained in the Yakima Valley of Washington at \$18 per ton sacked, but that also is far below the price which prevailed at the opening of April.

The Chicago carlot market was weak on most arrivals. Northern round whites had declined to \$1.30-\$1.60 per 100

pounds and Idaho Russets to a level of \$1.60, with Colorado McClure's bringing \$2-\$2.15. "Futures" on Idaho Russets for late April delivery were being made at \$1.70, but October "futures" had declined to an average of \$1.58 and round whites to \$1.15. Eastern jobbing markets quoted most sales of Maine Green Mountains at \$1.85-\$2.65 per 100 pounds.

### Crop Prospects

Total acreage of commercial potatoes in the early, second-early and intermediate states together is now expected to be 350,140 acres, or 5% more than last year. This would be the heaviest planting since 1928 and only 10% below the record acreage of that season. With better yields expected in Florida this year, the commercial early crop in that state is forecast at 2,930,000 bushels, as against 2,480,000 in 1930. The gain is entirely in the northern part of the state. The lower valley of Texas expects only 778,00 bushels, compared with 1,530,000 last season. Condition of the entire early crop in April was around 80% of normal, or about the same as a year ago and two points below the 10-year average.

March reports of growers intentions to plant potatoes indicate a total increase for the United States of about 11% over last year's harvested acreage. Under average growing conditions, such an acreage could easily produce between 400,000,000 and 430,000,000 bushels of potatoes, which doubtless would mean lower prices than during the past season. The 1930 crop was only 361,000,000 bushels.

Forty-six cars of Idaho Russet potatoes were delivered through the Chicago Mercantile Exchange today, on the April futures trading contract. This lot of 1,656,000 pounds was a part of the trainload of Idaho potatoes which arrived in Chicago over the Chicago and Northwestern railroad early this week.

There were 58 cars of potatoes in that shipment, said to be the largest single shipment of potatoes ever to reach Chicago and the first time an entire train has consisted of cars of potatoes.

There are around 40 more cars of potatoes slated for delivery through the Exchange within the next few days, unless hedges are all removed by re-purchase of contracts. Many previous sales have been covered within the last few days.

This was the largest block of potatoes delivered through the exchange since trading in potato futures opened last January.

Trading in October delivery of Idaho Russets and Round White potatoes opened on the Exchange April 1. October

Idahoese sold for \$1.65 at the opening. Round Whites for October delivery started out at \$1.35 but a sudden rush of selling orders near mid-session on the first day of trading dropped the price to \$1.25.

Trading in potato futures on the Chicago Mercantile Exchange during March established a new volume record of 721 cars, this figure bringing the total trading for the year to 2,016 cars.

April Idaho Russets showed a considerably stronger tone toward the close of the month, although a slight uneasiness developed in the last week. The delivery ended the period at \$1.77, a 10c advance compared to the close of February.

There was a sudden price bulge near the middle of March which carried the price up to \$2. Buying activity in heavy force was aroused by reports that a considerable shortage of round whites existed and weather reports indicating a probable set-back for the new crop.

However, the active rise resulted in heavy hedging orders being placed, reflecting the opinions of potato handlers that the bulge would not be sustained. The result was an easing from the peak price.

Trading ceased in the March delivery early in the month, the commitment being reduced to zero. March Idahoese opened at \$1.95, reached a high of \$2, a low of \$1.56 and the last sale was made at \$1.57. A number of cars were delivered on the March contract, closing out the commitment.

The April commitment mounted to 174 cars open, the selling and buying in of hedges as the market fluctuated holding the open commitment below that number toward the close of March.

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## Review of Recent Literature

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*Salaman, R. N.* Somatic mutations in the potato. Rep. and Proc. IXth International Horticultural Congress: 117-140. 1930.

From observations of the behavior of mutations of Arron Victory when subjected to methods similar but modified from those employed by Asseyeva, the view is reached that the splashed color mutations are due to a mosaic of color forming and colorless cells; that the mosaic "represents the tentacles, so to speak, of a mass of mutated cells lying in the deeper tissues."

—F. A. KRANTZ.